Induced breeding and mass seed production of pool barb (Puntius sophore) – a nutrient-dense small indigenous fish species in Assam

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Introduction

- Integrating small indigenous fish species (SIS) into conventional carp polyculture systems holds great promise for addressing micronutrient deficiencies in nutritionally disadvantaged human landscapes.
- Among the diverse SIS in Assam, the Pool barb (*Puntius sophore*) belonging to family Cyprinidae stands out as an exceptional candidate, abundant in vital micronutrients such as calcium and vitamin B12.
- Previous studies have already demonstrated the successful incorporation of Pool barb into composite culture with carps, making it an ideal lighthouse species for promoting nutrition-sensitive aquaculture approaches in the region.
- Supply of SIS seed is prerequisite for accelerating the nutrition-sensitive aquaculture approaches and hence the development of hatchery-based mass seed production technologies that are easily replicable at farmer's field.
- Successful research work on development of hatchery-based mass seed production technologies of SIS has emerge as needs of the hour.
- This research presents successful captive breeding and seed production of Pool barb conducted at a farmer's field in the Darrang district of Assam.

Material and Methods

- The induced breeding trial was conducted at a private hatchery facility in Darrang district of Assam during the month of July 2023.
- Breeding arrangement was made in cement tanks, featuring a double hapa arrangement with 10 mm inner hapa and 250-micron outer hapa (Fig 3) and continuous oxygen-rich water showering. To facilitate egg-laying, artificial grass substratum was thoughtfully provided at the bottom of the inner hapa.
- The female breeders were identified by their swollen round or oval abdomen and larger body size than male (Fig 1). The mature males were identified with their flat abdomen and reddish lateral mark in both side during breeding season which was not observed in female (Fig 2).
- Breeders were conditioned under continuous shower in separate tanks for 3 hours prior to hormone administration.
- The hormone was diluted 15 times in 0.65 % sterile NaCl solution and administered using an insulin diabetic syringe of 1 ml capacity with 40 graduations.
- Diluted inducing agent was administered through the peritoneal cavity (Fig 4) at two different doses of 0.3 ml and 0.5 ml per kg of body weight of female, while males received a fixed hormone dose of 0.2 ml per kg of body weight.. The sex ratio was maintained at 1:1.
- The following parameters were recorded as the indices of the effectiveness of two different dose response or ovulation rate, fertilization rate and hatching rate were calculated using the following formula.

$$\text{i. Ovulation (\%)} = \frac{\text{Nos of fish ovulated}}{\text{Total no of fish injected}} \times 100$$

$$\text{ii. Fertilization (\%)} = \frac{\text{Nos of fertilized eggs}}{\text{Total no of eggs released}} \times 100$$

$$\text{iii. Hatching (\%)} = \frac{\text{Nos of eggs hatch out}}{\text{Total no of frtilized eggs}} \times 100$$

Fig 1. A gravid female of *P. sophore*

Fig 2. A mature male of *P. sophore*

Fig 3. Breeding hapa arrangement

Fig 4. Hormone injection at peritoneal cavity

Results and Discussion

- The average body wight of *P. sophore* brooders were recorded 7.16 ± 1.14 and 13.62 ± 1.87 g (Mean ± SE) for male and female respectively.
- Spawning was achieved within an average latency period of 6 to 8 hours after hormone administration.
- Eggs were found attached at the inner wall of outer hapa of 250 micron and surface of the artificial grass (Fig 5 and Fig 6).
- Fertilized eggs were golden brownish colour, clear in appearance and highly sticky in nature.
- First hatchling was observed after an incubation period of 15 – 17 hours at 26.50 to 27. 30 °C of water temperature (Fig 8).

Fig 5. Eggs attached at inner wall of outer hapa

Fig 6. Eggs attached at artificial grass substratum

Fig 7. Microscopic view of a developed embryo

Fig 8. Microscopic view of a fresh hatchling

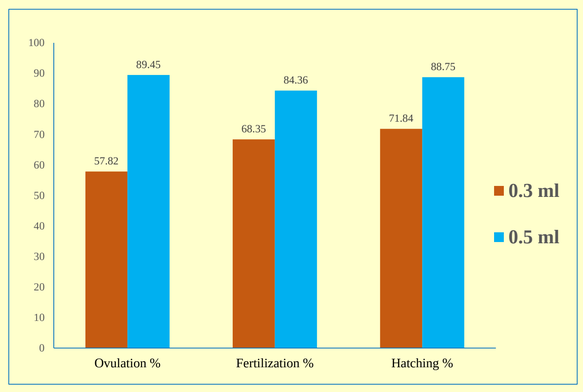

Fig 9. Graphical representation of ovulation, fertilization and hatching rate of *P. sophore* of two different hormone doses

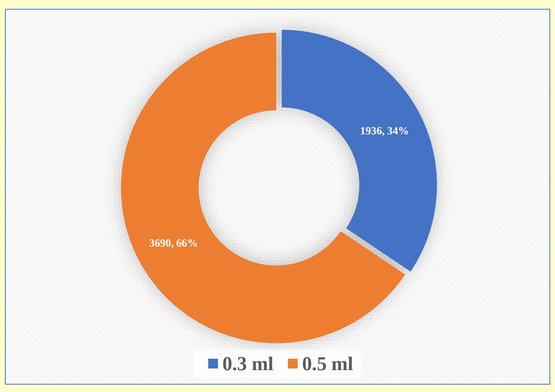

Fig 10. Graphical representation average of eggs released by females *P. sophore* with two different hormone doses.

- The ovulation rate, fertilization rate, hatching rate and eggs output were determined from the different trials and presented graphical form (Fig 9 and Fig 10).
- In this study, a significantly higher (p<0.05) ovulation rate was recorded 89.45 % with the hormone dose of 0.5 ml, where as ovulation rate of 57.82 % was recorded with dose 0.3ml. Islam *et al.* (2011) have observed best ovulation rate (95%) with a dose of 7mg/kg body weight in induced breeding experiments of *P. sophore* with 4 different dose of PG.
- The fertilization and hatching rate (84.36 % and 88.75 %) were recorded significantly higher (p<0.05) with dose 0.5ml. Yesmine *et al.* (2020) observed highest fertilization and hatching rate (98 %) with pituitary gland extract at 6mg/kg body weight in *Puntius sophore*. Islam *et al.* (2011) reported highest fertilization and hatching rate (90 and 84 %) with PG dose of 7mg/kg body weight in *Puntius sophore*. In terms of fertilization a better result was observed when used PG dose of 5.5 to 6.5mg/kg body weight in female Sarputi, *P. sarana* which is close to *P. sophore*. (Chakraborty *et al.* 2002, Siddik *et al.* 2008).

Conclusion

- The administration of appropriate dose of hormone is the basic to success of induced breeding as well as the condition of the brood fish and environment conditions are also equally important.
- In the present study, comparatively a better breeding performance was observed with hormone dose of 0.5ml/kg body weight than the 0.3ml body weight in terms of ovulation, fertilization and hatching rate.
- This finding helps to explore the mass seed production of *P. sophore* in captive conditions which will accelerate the nutrition-sensitive carp-SIS polyculture to underscore the potential of sustainable aquaculture practices for combating the nutritional challenges and herald a promising food secured future.

References

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